Purpose: Generate a discussion on possible training concepts needed for long duration space missions (LDSM).

There has been papers about maintenance and psychological training for LDSM. There are papers on the technology needed for LDSMs. Few are looking at how ground-based pre-mission training and on-board in-transit training must be melded into one training concept that leverages this technology. Even more importantly, fewer are looking at how we can certify crews pre-mission. This certification must ensure, before the crew launches, that they can handle any problem using on-board assets without a large ground support team.

Methodology

Start with a discussion of the present training concepts for the Shuttle and Station.
Discuss how the demands for LDSMs will require new training concepts.
Discuss how any new training concept must account for training on-board in such a manner as to reduce pre-mission training while still maintaining crew safety and mission success.

Results

We must develop a training concept to train astronauts on the ground in a year so that, using all the tools on board, the crew can determine the cause and remedy for any hardware, software, trajectory, or mission operations problem, and then replan their mission. A training concept must give the crew the skills to handle the scenario where, if they lost half of their power generation capability, they could

- regain as much power as possible,
- change software to manage the limited power,
- run several scenarios to optimize their activities on Mars within their power constraints,
- change their procedures and documentation,

while understanding the changed system performance boundaries and risks

Conclusions

LDSM will require a new training concept. That concept must take into account factors that our present training for Low Earth Orbit missions does not. This training concept must blend pre-mission and on-board training in such a way to give crews new capabilities. Pre-mission training may become training the crew on what tools they have available to them, and how to use them to come up with their own solutions.

Areas for discussion

If systems knowledge is in the Knowledge Management System, procedure knowledge is in the Performance Support Tools, and pre-mission training is aimed at training the crews how to use their on-board tools, how do we certify pre-mission that the crews are fully trained to ensure their safety and mission success?